

CLAIMS

1. A PEM fuel cell comprising (1) a proton exchange membrane having opposing cathode and anode faces on opposite sides of said membrane, (2) a gas-permeable electrically-conductive current collector engaging at least one of said faces, and (3) a current-collecting plate engaging said gas-permeable current collector and defining a gas flow-field confronting said gas-permeable current collector, said flow-field comprising a plurality of lands engaging said gas-permeable current collector and defining a plurality of gas flow-channels, each of said flow-channels having (a) an inlet end communicating with a supply manifold that supplies a reactant gas at a first pressure to all of said flow-channels, and (b) an exit end communicating with an exhaust manifold that receives said gas from said flow-channels, a first flow-restrictor in a first flow-channel to reduce said first pressure to a second pressure downstream of said first flow-restrictor that is less than said first pressure, and a second flow-restrictor in a second flow-channel next adjacent said first flow-channel for maintaining a third pressure in said second flow-channel upstream of said second flow-restrictor sufficiently above said second pressure to drive said gas from second flow-channels into said first flow-channel through said gas-permeable current collector.
2. A PEM fuel cell according to claim 1 wherein said flow-channels each have a first cross-sectional area transverse the direction of gas flow through said flow-channel, and at least one of said flow-restrictors comprises a constriction in said flow-channel having a second cross-sectional area less than said first cross-sectional area.
3. A PEM fuel cell according to claim 1 wherein at least one of said flow-restrictors comprise a tortuous segment of said flow-channel.

4. A PEM fuel cell according to claim 1 including a plurality of ports each communicating a said manifold with a said flow-channel, and at least one of said flow-restrictors is a said port sized to provide said second and/or said third pressures.

5. A PEM fuel cell comprising (1) a proton exchange membrane having opposing cathode and anode faces on opposite sides of said membrane, (2) a gas-permeable, electrically-conductive current collector engaging at least one of said faces, (3) a current-collecting plate engaging said gas-permeable current collector and defining a gas flow field confronting said gas-permeable current collector, said flow-field comprising a plurality of lands engaging said gas-permeable current collector and defining a plurality of gas non-serpentine flow-channels, each of said flow-channels having (a) an inlet leg communicating with a supply manifold that supplies a reactant gas at a first pressure to all said flow-channels, (b) an exit leg communicating with an exhaust manifold that receives said gas from said flow-channels, and (c) at least one medial leg intermediate said inlet and exit legs, a first flow-restrictor in the inlet leg of a first of said flow channels for producing a second pressure downstream of said first flow-restrictor that is less than said first pressure, and a second flow-restrictor in the exit leg of a second said flow-channel next adjacent said first flow-channel for maintaining a third pressure in said second flow-channel upstream of said second flow-restrictor sufficient to drive said gas between said first and second flow-channels through said gas permeable current collector.

6. A PEM fuel cell according to claim 5 wherein each said flow-channel is branched so as to provide a medial leg having at least first and second branches, each having a first end communicating with said inlet leg and a second end communicating with said exhaust leg.

7. A PEM fuel cell according to claim 6 wherein said flow channel is bifurcated and said first branch has a third flow-restrictor proximate said first end that reduces the pressure in said first branch downstream of said third flow-restrictor to a fourth pressure that is below said second pressure, and said second branch has a fourth flow-restrictor proximate said exit leg for maintaining a fifth pressure in said second branch upstream of said fourth flow-restrictor sufficient to drive said gas between first and second branches through said gas permeable current collector.

8. A PEM fuel cell comprising (1) a proton exchange membrane having opposing cathode and anode faces on opposite sides of said membrane, (2) a gas-permeable electrically-conductive current collector engaging at least one of said faces, (3) a current-collecting plate engaging said gas-permeable current collector and defining a gas flow-field confronting said gas permeable current collector, said flow-field comprising a plurality of lands engaging said gas-permeable current collector and defining a plurality of non-serpentine gas flow-channels, each of said flow-channels having (a) an inlet leg for receiving gas at a first pressure from a supply manifold common to all said flow channels, (b) an exit leg for discharging said gas into an exhaust manifold common to all said flow-channels, and (c) first and second medial legs intermediate said inlet and exit legs, said medial legs each having a first end communicating with said inlet leg and a second end communicating with said exit leg, said first medial leg having a first flow-restrictor proximate said first inlet leg that reduces the pressure in said first medial leg downstream of said first flow-restrictor to a second pressure that is below said first pressure, and said second medial leg has a second flow-restrictor proximate said exit leg for maintaining a third pressure in said second medial leg upstream of said second flow-restrictor sufficient to drive said gas between first and second medial legs through said gas-permeable current collector.